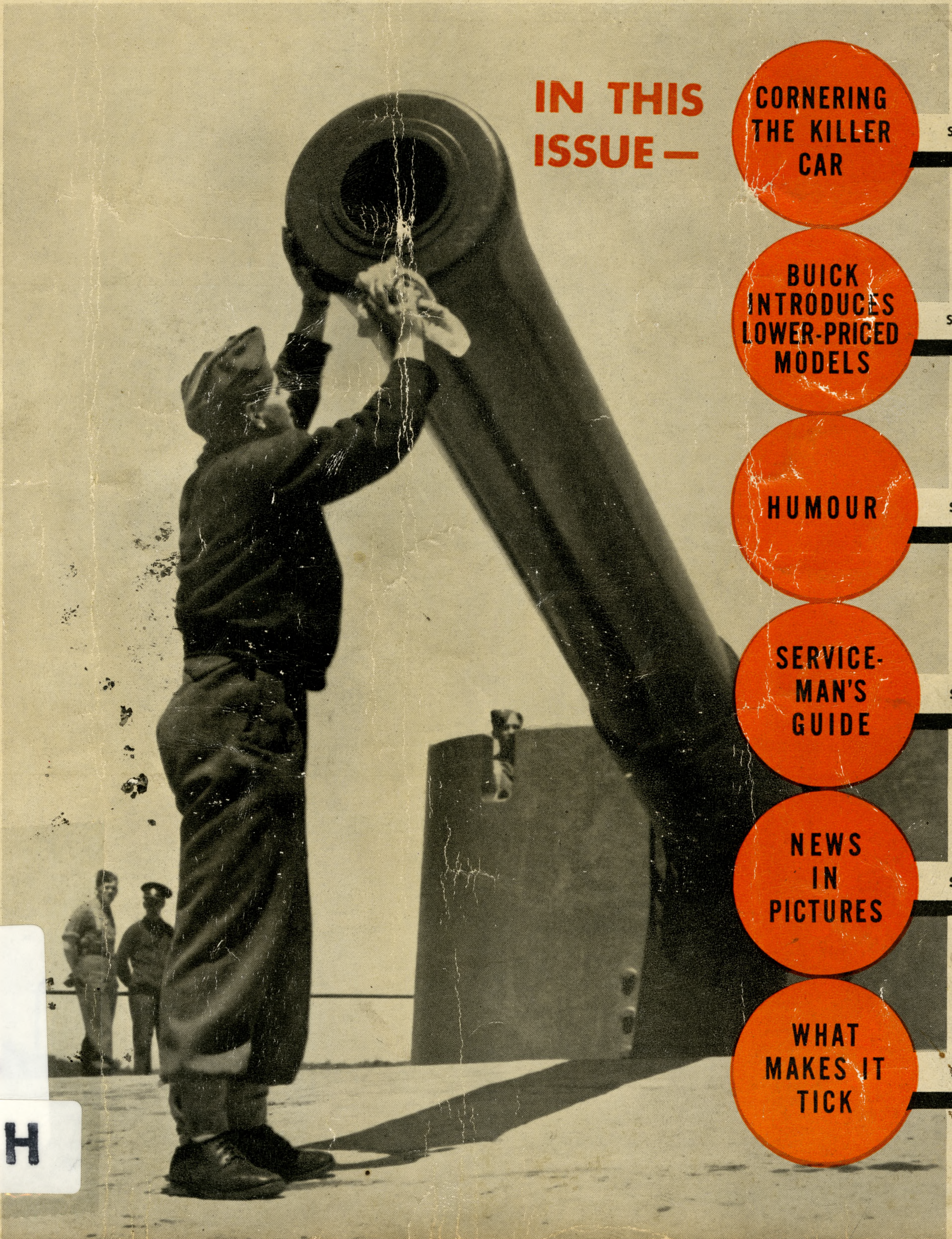
GM
GENERAL MOTORS PRODUCTS

PRODUCTS REVIEW

MARCH 1941



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PAM
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CHEVROLET FOR '41

DASHING NEW "ARISTOSTYLE" DESIGN
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BECAUSE it's the longest and largest, the liveliest and most luxurious car in the low price field . . . Because it's *styled ahead* and *sized ahead* . . . Because it carries the most sensational array of *advancements—41 outstanding features for '41* . . . the new Chevrolet, General Motors' No. 1 car, is the *style*-wise, *value*-wise, *future*-wise Canadian buyer's No. 1 choice this year!

Only Chevrolet, among lowest-priced cars, brings you so many *modern* features: A fashionable Body by Fisher, of the same *type* and *quality* used on many higher-priced cars . . . Tiptoe-matic Clutch . . . Safe-T-Special Hydraulic Brakes . . . Reinforced Unisteel Turret-Top . . . Fisher No-Draft Ventilation . . . You get them all, *plus record Chevrolet economy,* in Chevrolet for '41!

YEARS TO COME

BUY
WAR
SAVINGS
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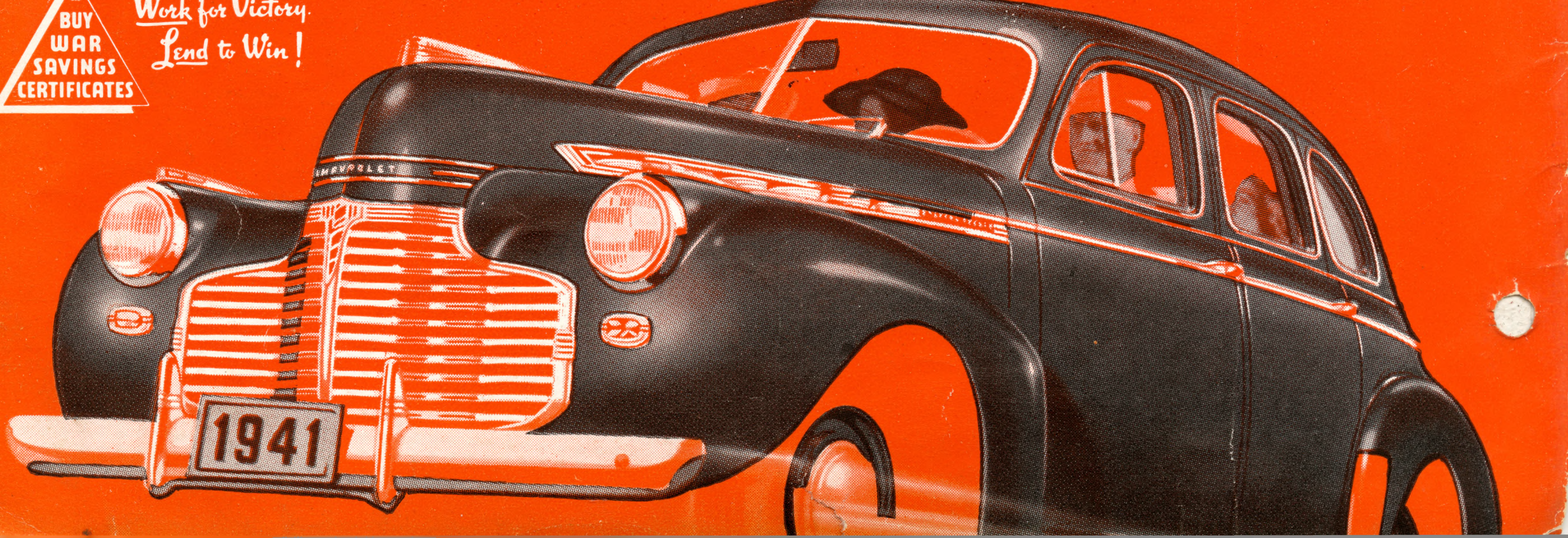
Work for Victory.
Lend to Win!



PRODUCTS GM GENERAL MOTORS PRODUCTS REVIEW

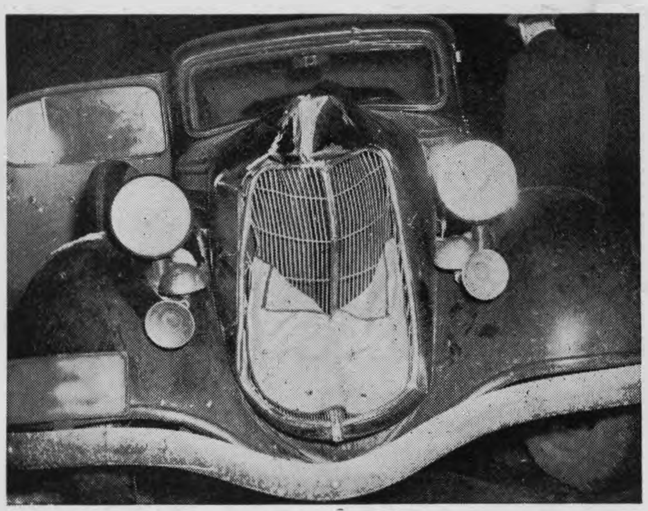
LOCAL HIST PAM 629 .205 PRD v. 3 no. 16

CORNERING THE KILLER CAR

Garageman Often Plays a Vital Role In Tracking Down the Cowardly Hit-Runner

A GIRL stepped on to the road. A fast car lurched around the corner, and the girl's body shot into the air. The car sped on, leaving her bleeding in the roadway. But the yellow driver ended in prison—because a garageman was wide-awake.

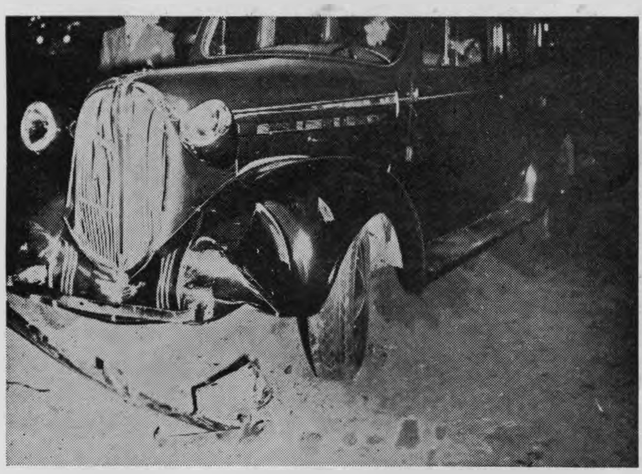
"The hit-and-run driver is a snake who must be exterminated. Garagemen and body-and-fender men are our greatest helpers in this job," says an officer of the Traffic Division of the Toronto Police Department. In charge of one of the finest organizations on the continent for tracking down auto criminals, the official gave a special interview to the General Motors Products Review, outlining the part the automotive service man can play in assisting the police to stamp out this grave and growing type of crime.



GUILTY—This is a killer car. Damage is restricted to headlight glass and radiator grille. Strong bumpers and fenders are seldom damaged in collision with a human body, and if they are, the dents have soft, rounded outline. Report this type of case to the police unless you have good reason to believe car is innocent.

A typical case came a few months ago when a General Motors Distributor helped police to track down a killer car. A woman was struck down by a car that roared off in the darkness. On the spot in a few moments, the police found a piece of metal moulding torn from the killer car. Police auto experts made a careful check at once—this type of moulding was used on only one line of car, they reported. General Motors distributors in Toronto were contacted, and in a few hours a distributor was found who had received an order for such a part the day after the accident. The police hurried to the garage which had placed the order. There was the killer car, still being worked on.

Another hit-run case was broken because the service man had marked down a car's mileage, the police official revealed. "A man was seriously injured last fall," he stated, "by a car which did not stop. We notified all police officers to be on the watch for front-end damage to cars, and each division began checking garages.



INNOCENT—This damage was caused in collision with another car. Extensive damage to bumper and sharp creases in fenders could not be caused by soft mass of human body. Suspect this type only if accident reported involving collision with car, bicycle or other hard object.

"About 9:30 in the evening a constable called headquarters to report a suspicious car parked near where a large gathering was being held. The car was spattered with mud and dirt from a long journey, but the right front headlight was clean, indicating it had had some attention recently.

"In another part of the city, a garage was found where a right headlight had been repaired—a

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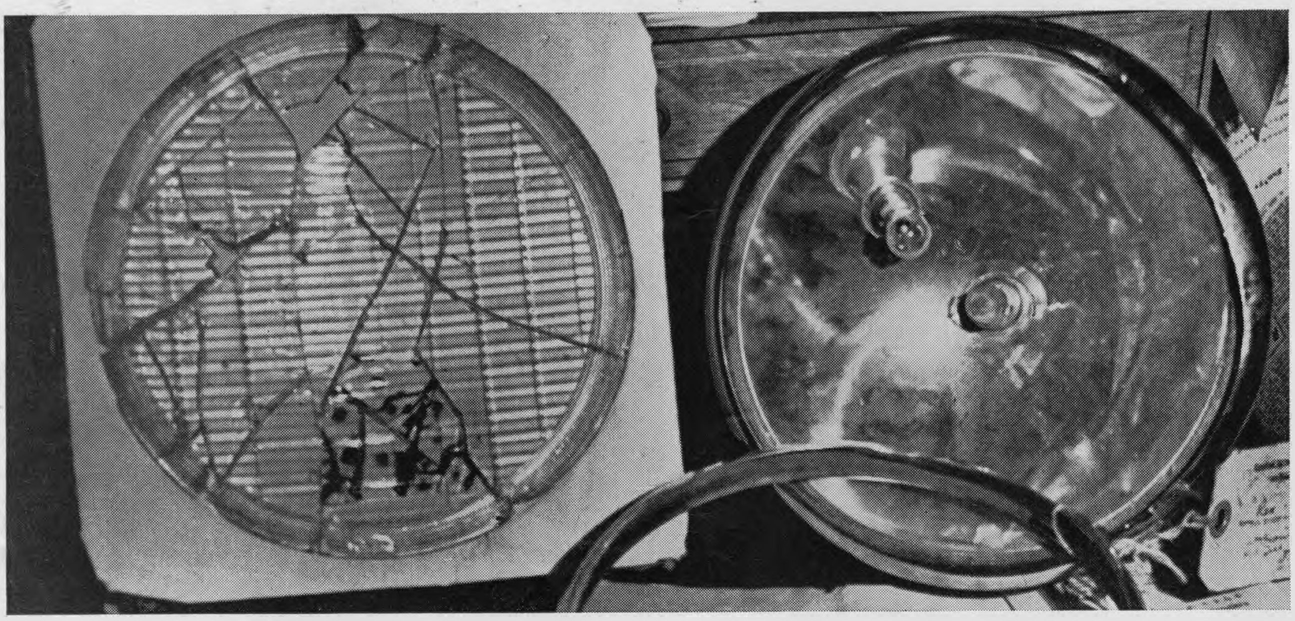
broken bulb and lens had been replaced and the driver had insisted on having a new headlight rim installed, rather than wait for the old one to be straightened out. This should have made the garageman suspicious, but he did not take the car's number. However, he did happen to mark down the mileage on the speedometer when he was servicing the car.

"The police immediately checked this mileage with that of the suspected parked car. There was just three miles difference. A police cruiser then drove over the route from the garage to the place where the car was parked—three miles. So we found another death-dealing car through the help of a garageman."

What is the garageman's part in cornering killer cars? Here is the advice of this police official, who has had the widest experience in traffic cases.



EVIDENCE WHICH CONVICTED—This pieced-together headlamp lens (left) was the keystone of the Crown's case in the recent conviction of a hit-and-run truck driver. After running down and killing a woman, the driver proceeded home, but fragments of the shattered lens still remained in the uptilted lamp (right). These were later matched with other glass fragments found beside the body.

"Every man who has a part in servicing cars should take special note of cars that come in for front-end repairs. Take special note of the type of damage. Collision with the soft mass of human body produces a very different type of damage than a collision with a rigid object, such as another car or a telephone post.

"In a hit-and-run case, usually there will be damage only to the weaker parts. Headlight glass is usually broken and the headlight may be bent backward. The weak radiator grille is often crushed in, but strong parts such as bumpers or fenders are left relatively undamaged. If these are dented, there will be rounded outlines, without tears or sharp creases. Look out for bits of clothing, flesh, hair or blood stains—report every such case.

"Take note of the driver of the car. Often in these accident cases he will be nervous. He is apt to be in a hurry, and won't care about expense. He is usually a stranger, because the tendency is to go into the nearest garage after the accident.

"If you find some of these circumstances, call your local police department to ask if there have been any accidents reported. If not, you may go ahead with the repair job. In every suspicious job, take notes of the damage, the time the car was brought in, the make, model, colour and, of course, the licence number.

"Here is an extremely important point—when you are suspicious of a car, never touch it until the police have told you no accidents have been reported. You may destroy valuable evidence if you go ahead with repairs of a hit-and-run driver's car. For instance, we had a case recently when an alert garageman called police before touching a suspected car. When we examined it, we found that bits of glass in the broken headlight fitted with other pieces found at the scene of an accident. From this evidence we were able to convict a man who had committed a serious hit-and-run crime. (See illustration on this page). If the garageman had cleaned out the headlight, we might never have brought that man to justice.

"Hit-and-run cases have been on the increase, and they must be stopped," continued the Toronto Police spokesman. "It is a cowardly crime to leave the victim of an accident uncared for, whether or not the car driver was at fault in the accident. The garage and service man is in a position to give us the greatest support in stopping this trend. If you have anything to do with car repairs, watch these points—help make the streets safe for your families."

PRODUCTS GM GENERAL MOTORS PRODUCTS REVIEW

VOL. 3, NO. 16 MARCH, 1941

EDITORIAL

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(Chevrolet, Pontiac, Oldsmobile, McLaughlin-Buick Cars—Chevrolet and GMC Trucks)

CANADA ON GUARD

(See Front Cover)

While the thunder of war reverberates across Europe, keen-eyed Canadian soldiers, sailors and airmen are constantly scanning the Dominion's approaches on the Atlantic and Pacific—just in case.

Symbolic of Canada's preparedness to meet any emergency which may threaten her shores is the illustration on our front cover of this month's issue, showing one of the mighty coastal guns which are manned and ready, day and night, for immediate action.

Not since the days of Wolfe and Montcalm has Canada known invasion from across the seas. But should the invader come, he will find a Canada prepared to fight with the courage and tenacity traditional of Britons everywhere.

A HELPFUL CONTRIBUTION

While assembly lines and mighty machines hum at an ever-accelerating pace in the General Motors' plants from which flows a steady stream of army vehicles and munitions, the company is making another helpful contribution to Canada's war effort by conducting training schools for army instructors in automotive service and repair work.

Worked out in detail between General Motors Service technicians and the Department of National Defence, the plan calls for a two week's intensive course for 24 army instructors, who are undergoing the training in groups of eight men. The classes are being conducted on General Motors' premises at Oshawa, at the expense of the Company.

In addition to training these specially selected men, the Company has further extended the scope of this highly important contribution to the army mechanization programme by assigning Oshawa staff instructors to pay regular visits to various army camps. These General Motors technicians are rendering valuable service to the military authorities by advising army instructors on mechanical problems and assisting in maintaining the proper standards of skill and accuracy in military workshops.

This activity reflects the type of enterprising co-operation which is associated with General Motors' war time role, being in keeping with the Company's policy of extending all possible aid in the Dominion's war effort.

EVERY DOLLAR COUNTS

This is a time when every dollar counts in the fight against ruthless aggression. Still more ships, more guns, more planes and more munitions are required to "finish the job." All Canadians who cherish their heritage of freedom and the way of life for which the British Empire stands should require no urging to purchase War Savings Certificates. By doing so, they will be giving the Empire's fighting forces on land, sea and in the air the tools they require.

Are you doing your bit by buying WAR SAVINGS CERTIFICATES regularly?

CRUSHING IL DUCE

There is cause for pride on the part of all Canadians in recent reports from the battlegrounds of Libya and Somaliland, where British troops have made spectacular territorial gains in the latest tests of mechanized warfare.

In both official despatches and reports from war correspondents on the scene, great credit for these successes has been given to the Canadian-made trucks and tractors which transported the British troops, equipment and supplies in their victorious drive against the troops of Mussolini. Faster, more dependable and more adaptable than the mechanized equipment of the enemy, these military motorized units greatly simplified the task of encircling and crushing the disorganized Italians.

General Motors of Canada is proud of its achievement in having produced many of these units, and rejoices with all the Dominion in the latest additions to the age-old record of British victories.

NOTES AND COMMENTS

Statisticians report that there were 140,000 registered passenger cars and 2,900 trucks which covered 400,000,000 vehicle miles in the United States in 1907. By 1939 this had multiplied 700 times, bringing the mileage to the astronomical figures of 287,000,000,000.

Some British car manufacturers are sparing time to experiment on post-war models now.

Authorities on the subject tell us that the average life of a car is 8.2 years.

TIME OUT FOR LAUGHS!

Irate Co-ed: Hey, stop following me around. Didn't you ever see anyone like me before?
Frosh: Yeah, but I had to pay a quarter.

★

"There's only one thing wrong with me, blondie. I'm colour blind."
"You-all sho' mus' be, mistah."

★

"I represent the Mountain Wool Company, ma'm, Would you be interested in some coarse yarns?"
"Gosh, yes, tell me a couple."

★

"I always eat in this restaurant. You know, in lots of restaurants the waiters grab the plates away from you before you have finished.
"And they don't do that here?"
"Oh, yes, they do, but here you don't mind it so much."

★

He: Whenever I stand up to make a speech I don't know what to do with my hands.
She: Are you making a speech now?

★

Doctor: Wait a minute. You are too quick. I didn't tell you to say "Ah-h-h."
Patient: I know you didn't. I just caught a glimpse of your new nurse.

★

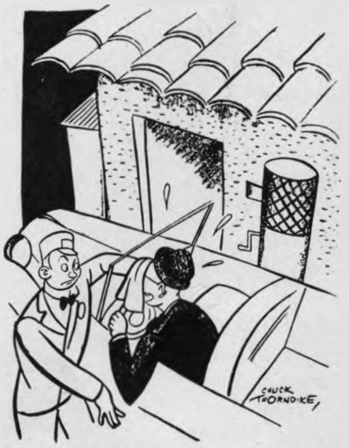
The lowly cub reporter who was assigned to cover the class plays of the high school came in for his share of literary fame when the following turned up in his write-up:
"The auditorium was filled with expectant mothers, eagerly awaiting the appearance of their offspring."

★

"Young man," cries the old lady to the fellow milking a cow. "Why aren't you at the front?"
"Huh," he says, "hain't no milk there, lady."

★

Sweet Young Thing: Is it easy to learn to play golf?
Sam: Sure, all you do is smack the pill and then walk.
S. Y. T.: How interesting—just like some of the auto rides I've been on.



"Can't you see the windshield is missing?"

Mike: I lost my dog last week.
Pat: Have you advertised for him?
Mike: Wouldn't be no use—he can't read.

★

Jim: My wife talks to herself.
Tom: So does mine, but she doesn't realize it—she thinks I'm listening.

★

"Did you hear about the canary with the wooden leg?"
"No, what about him?"
"His father was a woodpecker."

★

Bum: Say, Buddy, can you let me have a dime for a cuppa coffee?
Man: I thought coffee was only a nickel.
Bum: Yeah, but I gotta date.

★

"My wife kisses me every time I come home. That's affection."
"You're wrong. That's investigation."

★

"Do you love me, Pearl?"
"You know I do, Harry."
"Harry? My name's Doug."
"Of course! I keep thinking to-day is Monday."

★

She: Haven't I always been fair to you?
He: Yes, but I want you to be fair and warmer.

★

Joan: Do you hold Charlie's hand when you go to the movies?
Mary: Yes — — but I'm not always strong enough.

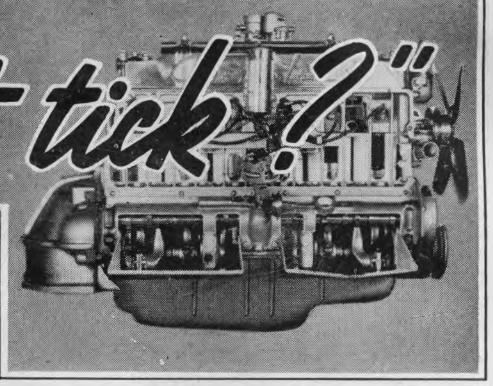
★

According to a noted oculist, 73 per cent of all adults need glasses. Presumably the other 27 per cent drink out of the bottle.

★

Q: Why should a girl never speak to the captain of a ship?
A: Because he's always forward.

"What makes it tick?"



The Four Stroke Internal Combustion Engine

The type of engine used in a vast majority of the modern passenger cars and trucks operates on gasoline, and is known as an *Internal Combustion Engine*. This term is applied because the combustion of the gasoline, which furnishes the power, takes place within the engine itself. The internal combustion engine is merely a mechanical device for transforming the power stored within gasoline into motion. Before gasoline can be burned it must be vaporized or broken up into little tiny drops. Then it must be mixed with a proper amount of air.

However, for our purpose at the present time, we can assume that we have the proper mixture at hand to burn as a source of power. Now, a means must be found to transform that power into motion. The simplest starting point is to confine the combustion.

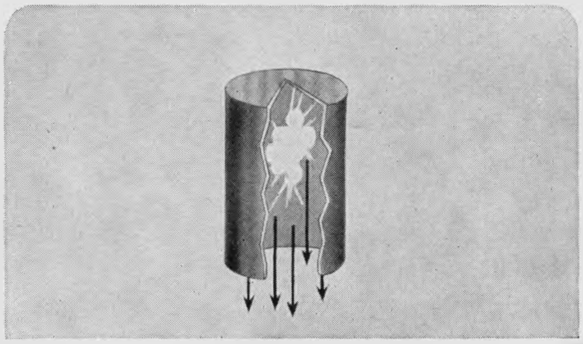


Fig. 333

In order to confine the combustion let's make it take place within a cylinder, closed at the top, but open at the bottom as shown in Fig. 333.

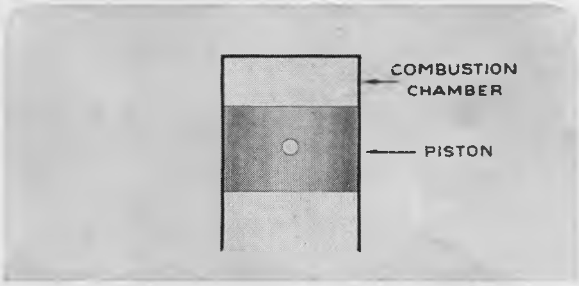


Fig. 334

Now let's insert a movable plug in the open end of the cylinder as shown in Fig. 334. This plug is called a *Piston*. The space between the piston and the top of the cylinder is called the *Combustion Chamber*. The power of the combustion of the mixture is exerted against the piston, tending to move it downward and out of the cylinder. This gives us the motion that we need.

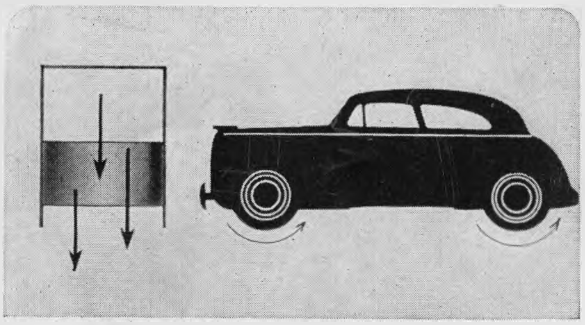


Fig. 335

It is easily seen, that the motion is in a straight line and is not continuous. Since it is inconvenient to use straight line motion to propel a car, the motion must be changed. Furthermore some means must be found of getting the piston back up into the cylinder, ready for another downward thrust, with a continuous motion.

The piston can be attached to a *Crank* by means of a *Connecting Rod*. The *Shaft* to which the crank is fastened is called the *Crankshaft*. Its dis-

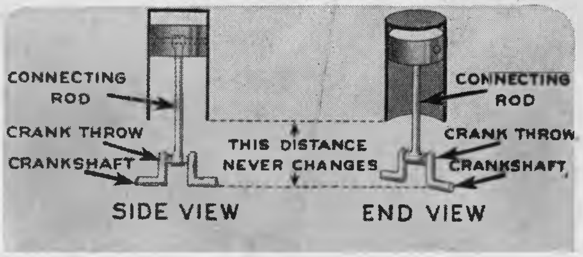


Fig. 336

tance from the cylinder never changes, (See Fig. 336) but it is free to revolve with a circular motion.

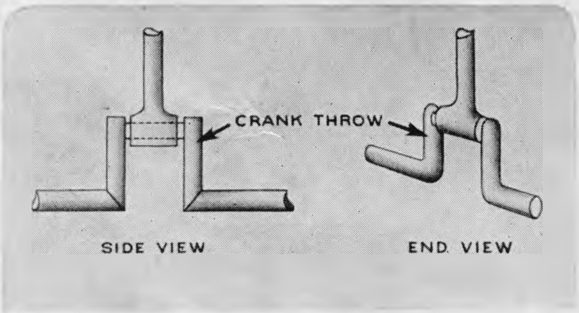


Fig. 337

The crank itself as shown in Fig. 337 is generally called the *Crank Throw* or *Crank Arm.* When force is properly applied to the crank throw it will make the crankshaft revolve.

The connecting rod is fastened to the piston by means of a *Piston Pin.* The connecting rod is free to turn on the piston pin. Now when the force of the combustion pushes the piston down in the cylinder, the connecting rod exerts force on the crank throw. This force on the crank throw causes the crankshaft to revolve, as shown in Fig. 338.

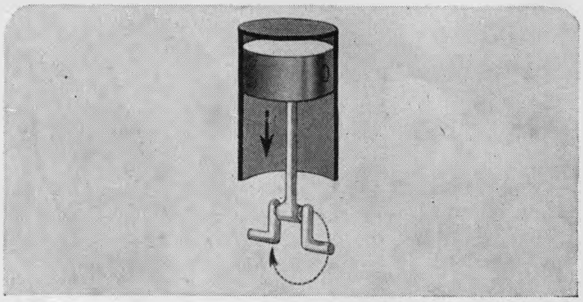


Fig. 338

Now let's add a large fairly heavy wheel to the end of the crankshaft, as shown in Fig. 339.

This wheel is known as the *Flywheel.* Once the flywheel and crankshaft are put in motion they have a very strong tendency to keep on turning. This is largely due to the weight of the flywheel.

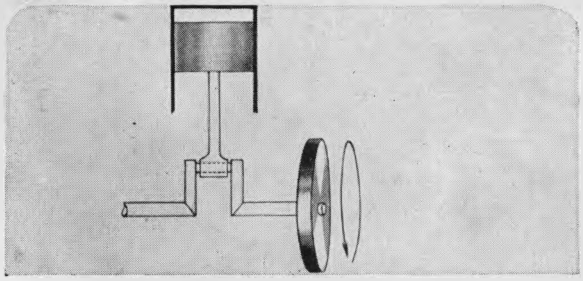


Fig. 339

Thus after the force of the combustion has started to revolve the *Momentum* of the flywheel keeps on turning the crankshaft, which moves the piston back up into the cylinder ready for another downward thrust.

If, every time the piston reaches the top of the cylinder, another mixture of gasoline is burned, the piston will move continuously up and down in the cylinder and the crankshaft will be in continuous circular motion. This is the basic principle of operation of all internal combustion engines. However, before the engine can be operated on a practical basis there are several more problems to be solved.

For purposes of simplicity, we have been assuming that the cylinder is closed at the top as shown in Fig. 333. Now, in order to get additional charges of the mixture taken into the combustion chamber we must put in a valve arrangement. The top of the cylinder is called the *Cylinder Head.* Now let's cut a hole in the cylinder head and attach an *Intake Manifold,* shown in Fig. 340. The intake manifold is used to bring the gasoline mixture to the cylinder. Since we do not always want the hole in the cylinder head open, an *Intake Valve* can be put in its place directly through the intake manifold and sealed against the cylinder head as shown in Fig. 341. The valve slides up and down in the *Valve Guide* so that it can be opened and closed as we wish.

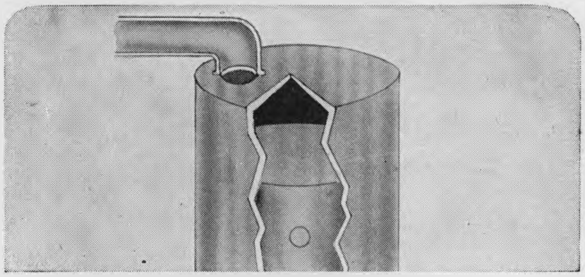


Fig. 340

When gasoline burns there are gases left so it is necessary to add another valve and manifold to allow the burned gases to escape before adding a fresh charge of fuel. This can be accomplished by cutting a second hole in the cylinder head and adding an *Exhaust Manifold* and an *Exhaust Valve,* again seating this valve against the cylinder

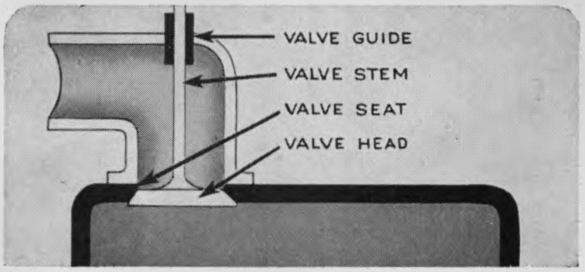


Fig. 341

head as shown in Fig. 342. With the means established for getting a fresh mixture into the cylinder, and the exhaust gases out, we can consider the principle of *Four-Stroke Cycle Operation.* All passenger car and truck engines built in this country operate on the four-cycle principle. The term four-stroke cycle is sometimes shortened to four-cycle.

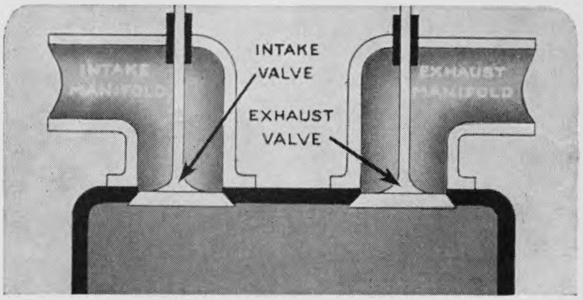


Fig. 342

The four strokes or divisions of the four-cycle operation are as follows:

1. With the piston at the top of the cylinder as shown in Fig. 343, the intake valve is opened (exhaust valve closed). Then, if the piston is moved downward its suction will draw the gasoline mixture into the combustion chamber. This continues about one-half a revolution of the crankshaft, and the movement of the piston and the crankshaft for one half a revolution is called a *Stroke.* The first stroke which draws in the gasoline is called the intake stroke.

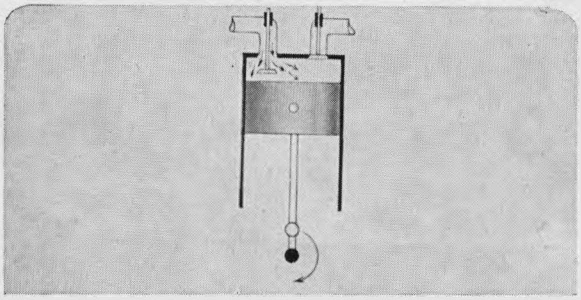


Fig. 343

2. Now as the piston is ready to start back up the cylinder for the first time, both valves are closed. This completely seals the combustion chamber. As the second half of this revolution gets under way the mixture in the combustion chamber is compressed (see Fig. 344) and because of this the second stroke in the cycle is called the *Compression Stroke.* Engineers discovered a long time ago that if gasoline mixture is compressed, or crowded into a smaller space than it would normally occupy, it will burn better and exert a much greater force. The compression stroke accomplishes this "crowding" in a four-stroke cycle engine.

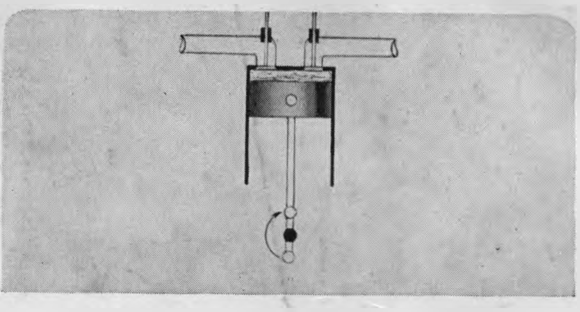


Fig. 344

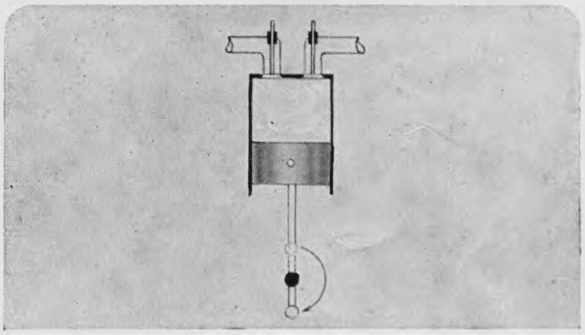


Fig. 345

3. Now as the piston is ready to start down for the second time, both valves remain closed and the mixture is ignited. The resulting combustion forces the piston down the cylinder as shown in Fig. 345. This third stroke of the piston delivers the power to the crankshaft, and is called the *Power Stroke.*

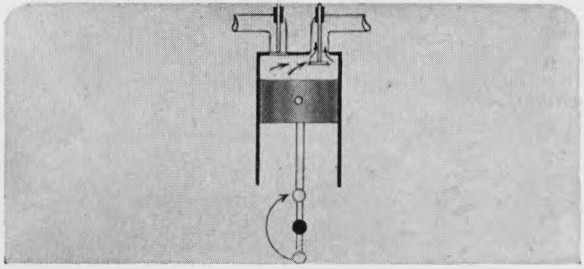


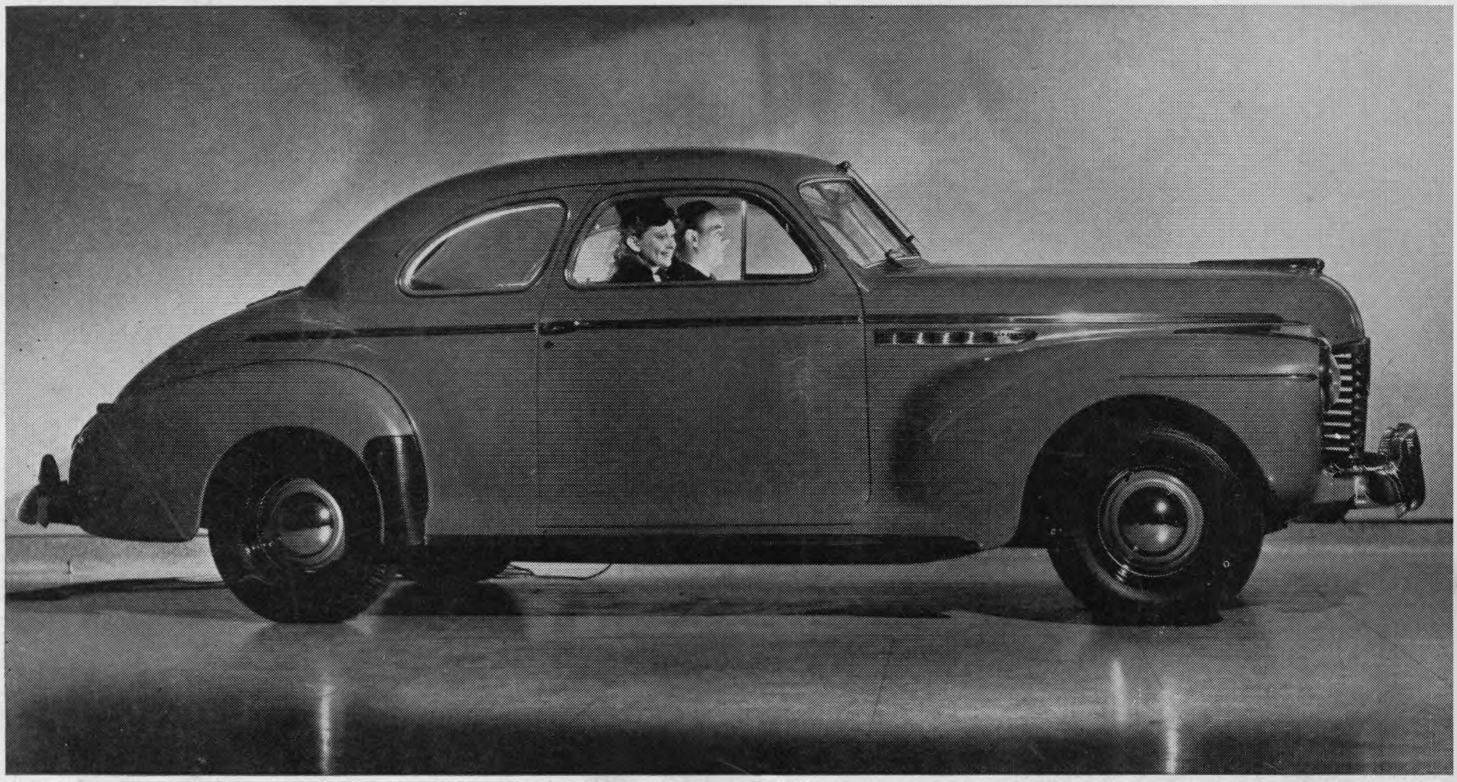
Fig. 346

4. As the piston is ready to start back up into the cylinder for the fourth stroke, the exhaust valve is opened (intake closed). Thus, as the piston

(*Continued on page* 10)

McLAUGHLIN-BUICK OFFE

★ Sport Coupe and Four-Door Sed



Traditional Buick Quality and Big-Car Features

IN THE LATEST SERIES

Two new lower-priced models—comprising the 4200 Series—have been added to the McLaughlin-Buick line. One is a sleek, six-passenger, four-door Torpedo Sedan and the other, a snappy, six-passenger Sport Coupe with full width rear seat.

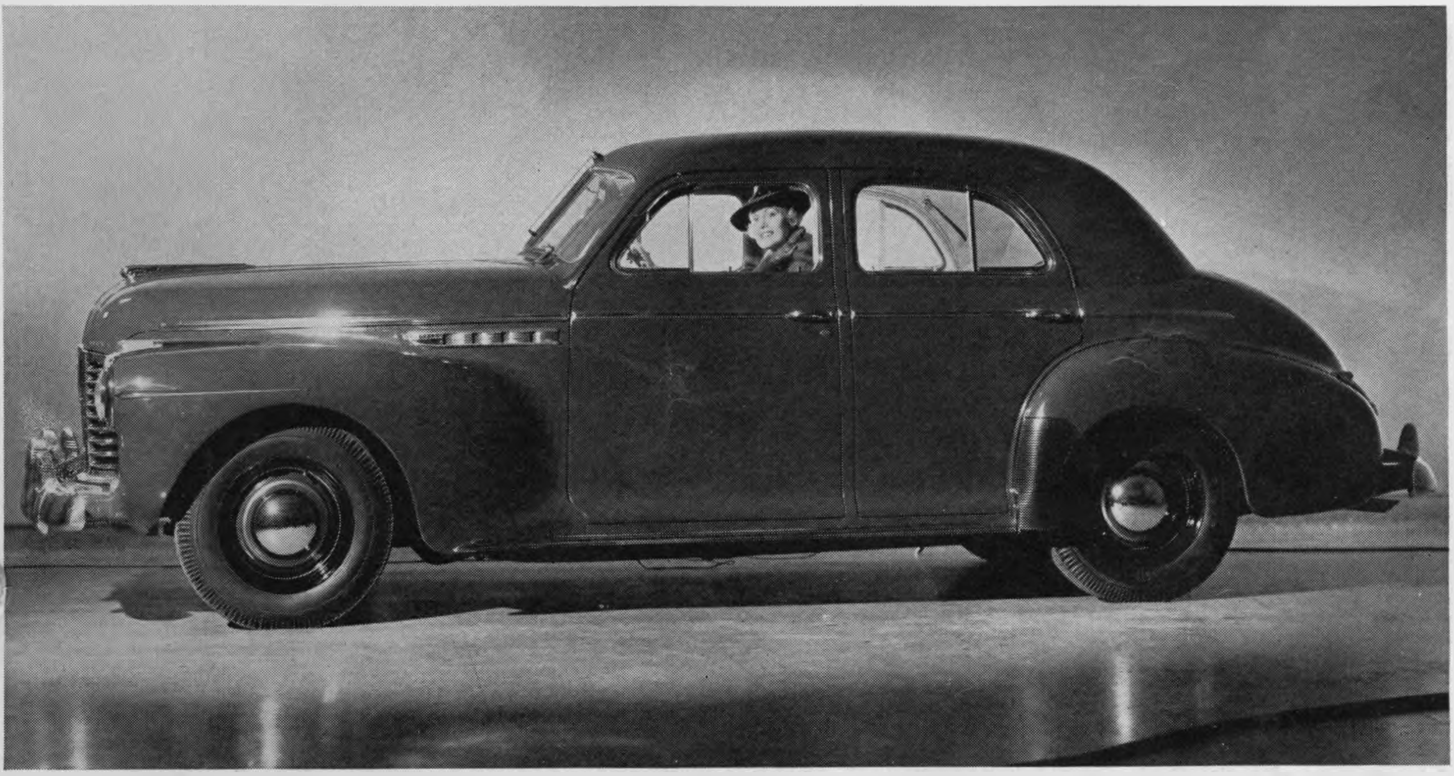
Although the tags bear lower prices, both models have all the big car features such as the valve-in-head straight eight "Fireball" engine developing 115 horsepower, with optional Compound Carburetion increasing horsepower to 125; concealed running boards; fore-n-aft direction signal; remote control gearshift; coil springs on all four wheels; knee action front suspension; torque tube drive; assist cords and ash trays.

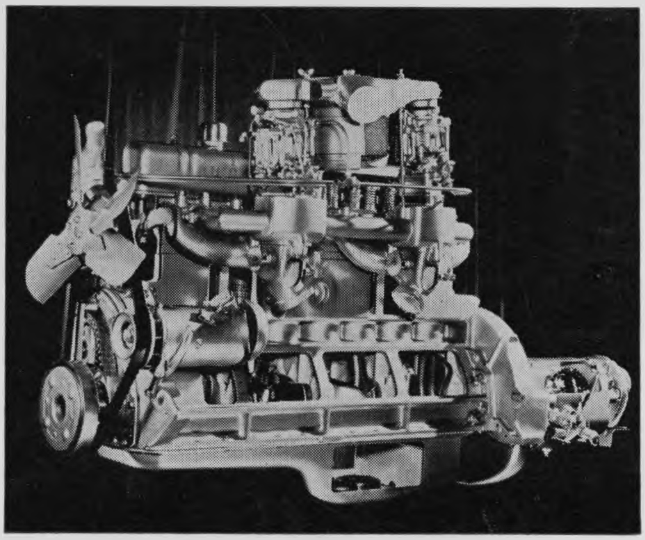
Wheelbase of the new cars is 118-inches—3 inches shorter than the 121-inch wheelbase of the Series 4400 models, and the overall length has been reduced by six inches. These changes permit a generous price reduction, without sacrificing the traditional McLaughlin-Buick quality or performance.

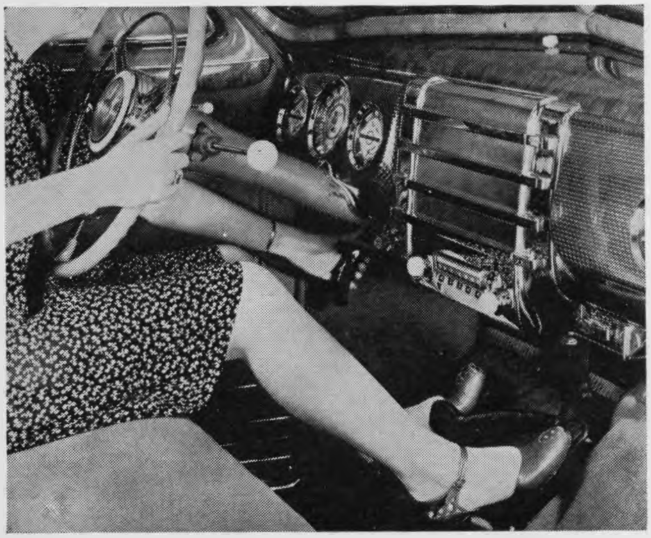
Ribbed Canada Cloth in mauve taupe was chosen as the upholstery of the 4200 models, while interior appointments are identical to the previously-announced 4400 Series. Externally, the 1941 McLaughlin-Buick advanced and distinctive restyling of bodies along the modernistic trend is retained in its full and impressive detail.

RS LOWER PRICED CARS

n Included in the "4200" Series ★







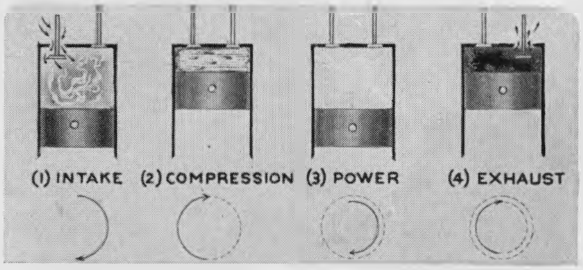
Traditional McLaughlin-Buick big-car quality and features are retained in the smaller 4200 Series. Among these are two illustrated here—the valve-in-head straight eight "Fireball" engine with optional dual carburetion, and the luxurious appointments of the front compartment, with remote control gearshift and distinctive instrument panel.

(*Continued from page* 7)

goes on up into the cylinder it pushes the burned gasoline out of the combustion chamber as shown in Fig. 346. This is known as the *Exhaust Stroke* and completes the cycle of operation. The combustion chamber is clear and ready to receive another charge of the mixture, beginning the cycle again.

Because the cycle of operation is accomplished with four strokes of the piston (two revolutions) the system is known as the four-stroke cycle. The necessity for the flywheel now becomes more clear. The power stroke must put sufficient weight in motion to carry the crankshaft and piston through three more strokes before another power stroke takes place.

All four-stroke cycle internal combustion engines operate on these principles. It makes no difference how many cylinders are employed nor how they are arranged. The things that distinguish one engine from another are simply changes in design and construction, not in operation principles. However, as stated before, several more things must be done before the engine we are using for an illustration can be operated practically.



(*"What Makes It Tick" continued in next issue of the G-M Products Review.)*

RELOCATING A 1940 FRONT SEAT

In abnormal cases where the adjustable front seat has been adjusted as far as possible toward the rear of the car and still more leg room is needed, the complete seat and the seat adjuster supports may be moved further back on the steel floor as much as 2½ or 3 inches. Before this is done, however, make sure that the adjustable mechanism has been extended to its rear-most position with the owner sitting in the seat, then measure to see how much more room is required.

Procedure

1. Remove the entire seat assembly from the car.
2. Turn back the rubber floor mat and remove the seat adjuster supports from the floor of the car. Also loosen and turn back the sound deadening felt on the floor adjacent to these supports.
3. Lay a straight edge across the support holes in the floor pan and draw connecting lines through the centre of these holes, as shown in Figure 228.
4. Using these connecting lines as a guide and depending on the amount the seat is to be moved back, measure from the centre of the old support holes to the location for the new and scribe or chalk mark this location as indicated by the circles at "A".
NOTE: A metal reinforcement, known as the seat adjuster support anchor plate, is spot-welded to the underside of the floor pan from the front to the rear and lies directly below the location for the seat adjuster supports on both sides. In drilling new holes see that the holes for the rear support do not extend beyond the anchor plate. If it is necessary to move the seat further back than this anchor plate allows, large washers or a short additional metal reinforcement should be added to the underside of the floor pan.
5. When moving the seat, it may be necessary to place a $\frac{1}{16}$ or $\frac{1}{8}$ inch shim under each support, particularly on the passenger side of the seat, in order to provide clearance between the raised centre section of the floor pan and the seat adjuster rod which is located underneath the seat. It may be advisable also to install an anti-rattle spring clip between the adjuster rod and the steel floor.
6. After the seat adjuster supports are installed, replace the floor insulating felt, rubber floor mat and the seat assembly.

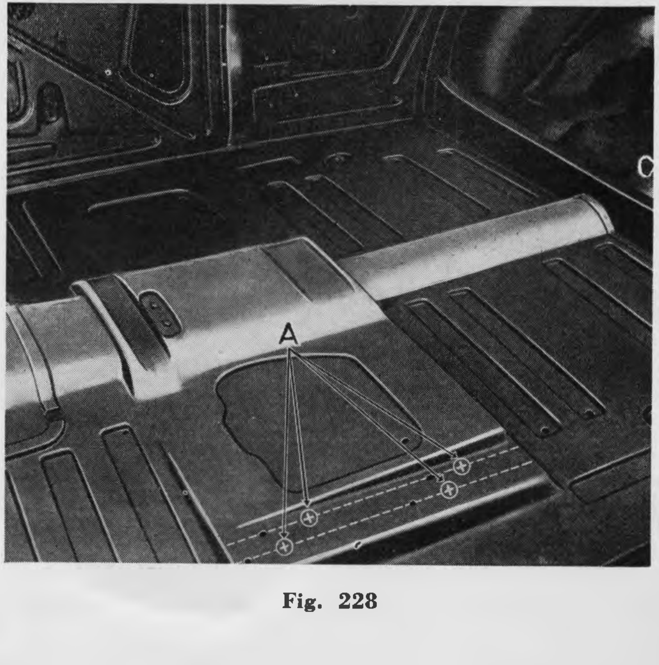


Fig. 228

THE SERVICE MAN'S GUIDE

Cooling System Thermostat

The efficient operation of the cooling system is undoubtedly one of the most important factors in the satisfactory and economical performance of the modern automobile engine. The cooling system actually has two jobs to perform, serving a dual purpose it must carry off a certain amount of the heat created by the engine to prevent excessive temperature building up, and at the same time the cooling system must maintain within the engine a sufficiently high temperature to insure efficient and economical operation.

Much has been written on the importance of keeping the system clean, prevention of corrosion, etc., and in this article we will deal exclusively with the thermostat and its operation, as well as the proper method of checking, cause of certain type failures, etc.

Operation

The thermostat bellows has an internal vacuum of approximately 13.7 lbs. per square inch at zero temperature. This vacuum causes the valve to be held in the closed position when cold.

The bellows also contains a volatile liquid charge which is transformed by heat to a vapour which exerts a pressure (vapour pressure) within the sealed bellows. The valve is raised off the seat by the combination of this vapour pressure overcoming the vacuum, and through the spring force of the bellows.

As the cooling solution surrounding the bellows of the thermostat increases in temperature, due to the heat created in the engine, heat is transmitted through the thin metal discs of the bellows to the volatile liquid charge inside of the bellows.

As heat is absorbed by the liquid charge, the vapour pressure is developed which counteracts the vacuum or negative pressure, and reduces this force tending to hold the valve on its seat.

When the temperature stamped on the valve is reached, the valve starts to rise due to the spring force of the bellows and the vapour pressure overcoming the vacuum.

Additional increase in water temperature results in a corresponding increase in vapour pressure inside the bellows allowing the valve to open further until the maximum stroke, limited by a stop, is reached, as shown in Fig. 30.

It requires approximately 16 to 18 degrees of temperature change to raise the valve from the START TO OPEN to FULLY OPEN position.

Variation of internal cylinder block pressures

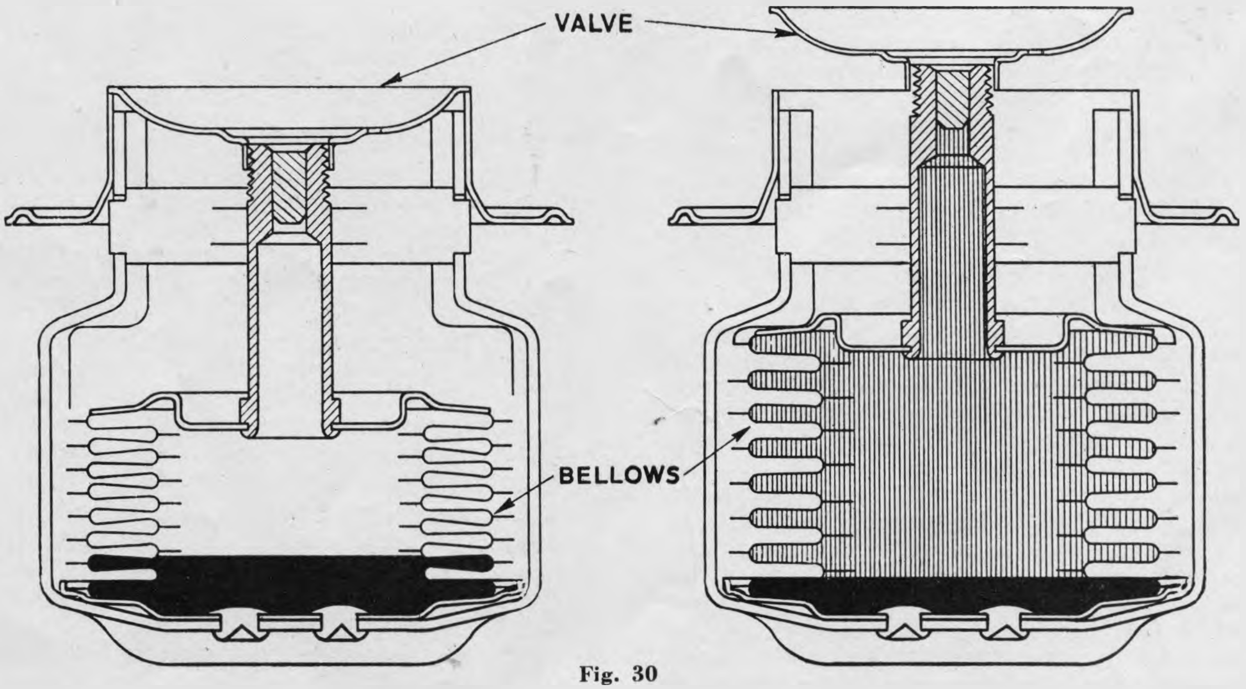


Fig. 30

due to changes in engine speed or load, have little or no effect on the controlled temperature, as the effective areas of the valve and bellows of the thermostat have been designed to balance each other.

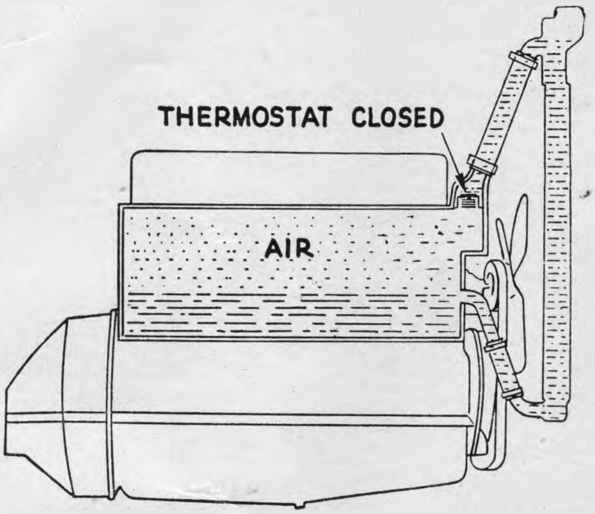


Fig. 31

Burst Bellows

Thermostats with burst bellows are invariably caused by overheated engines, resulting from loss of cooling solution, which usually is due to other troubles in the cooling system.

Leaks in hose connections, water pumps, cylinder block or radiator, reduce the level of the cooling solution and cause the engine to overheat. When this occurs, it is not unusual for the bellows to be subjected to temperature in excess of 275 degrees, developing internal pressures of 75 lbs. per square inch causing the bellows to burst.

However, under such circumstances, the spring force of the bellows is sufficient to hold the thermostat valve open and permit circulation. With this type failure, the engine will operate satisfactorily after refilling, but there will be no temperature control since the valve will be in the open position at all times.

Improper Filling of the Cooling System

On initial filling of the cooling system on new cars or in any case where the entire cooling system has been drained for any reason, such as to add anti-freeze, repairs, etc., it is possible to trap a considerable quantity of air in the system which will displace an equal volume of cooling solution, as shown in fig. 31.

From a casual observation of the level in the radiator, the system will appear to be full; however, as soon as the thermostat valve opens, the trapped air is released and the cooling solution level drops or is reduced in proportion to the volume of the air that had been trapped.

It is therefore very important, especially on new cars which have a tendency to run hotter than normal due to the relatively high friction of working parts, to recheck the filling level AFTER the normal operating temperature has been reached, or in other words, after the thermostat valve is off its seat or open, permitting a circulation through the radiator.

Normally the cooling system is bled of air while filling, through the small hole in the thermostat valve, but it is quite possible for this small hole to become clogged with foreign matter or to be frozen shut when plain water is drained from the system at sub-freezing temperatures, which frequently happens with new cars in storage or transit.

If the amount of water displaced by trapped air is sufficient, the cooling solution level may be reduced to such an extent that certain parts of the engine, cylinder head, etc., would have little or no water, resulting in violent local boiling which may cause serious damage, including complete rupture of the thermostat, (see fig. 32).

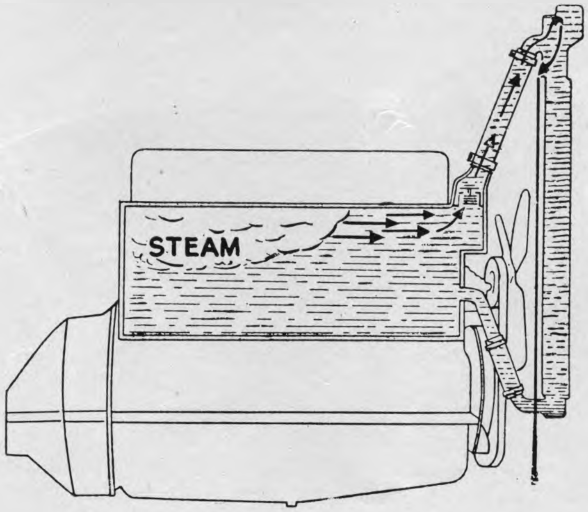


Fig. 32

Low Control Temperature

If, after a few minutes of operation, the engine cooling solution temperature does not approximate the temperature stamped on the thermostat, causing lack of heat for proper car heater operation, several things may be wrong or responsible:

1. The thermostat valve may not seat properly, allowing cooling solution to pass before the operating temperature has been reached, causing considerable delay in the warm-up, or low control or operating temperature under very cold atmospheric conditions.
2. The flange joint may be satisfactorily sealed due to a bent flange or improper installation, permitting cooling solution to by-pass the thermostat and result in the same condition outlined above.
3. The thermostat bellows may have failed due to the disc metal or solder fatiguing

or breaking after having opened and closed several thousand times.

When this occurs to the bellows, there is a partial loss of evacuation or its ability to pull the valve toward the closed position when the temperature drops, which causes the thermostat to control lower than the normal operating temperature stamped on it.

To determine whether the thermostat has failed, test it for "CLOSED" temperature according to the testing procedure at the end of this article.

Complete Failure

In cases where rupture of the thermostat bellows is large enough to permit complete loss of evacuation or ability to pull the valve toward the closed position, the bellows are designed to hold the valve open by its spring force and in this manner prevent overheating.

Obviously, if this type failure occurs while the bellows is submerged, cooling solution will be drawn into the bellows due to the vacuum and will assist in holding the valve off its seat.

All cooling system thermostats are stamped with the temperature at which the valve starts to open. Thermostats with temperature marking higher than 151 degrees are intended for use only with permanent type anti-freeze such as Ethylene-Glycol, Glycerine, etc., and should never be used with anti-freezes having a low boiling point such as alcohol, etc.

Due to the so-called after-boil or rising temperature of the cooling solution when the engine is stopped or allowed to idle after a high speed run, low boiling point anti-freezes are rapidly vaporized, and if this temperature is allowed to exceed the boiling point of the cooling solution, violent surging occurs and large quantities of the solution may be displaced by the vapour and forced out of the overflow pipe on the radiator.

Should the operation of the car be continued without replacing this lost cooling solution, additional quantities of the solution will be lost with each excessive stop until the level gets down to where the cooling system can no longer function, and the engine overheats. Under this condition steam may be developed and the thermostat bellows will be subjected to very high temperatures, producing internal pressures of 75 lbs. per square inch, causing the bellows to burst.

In recent years due to the public demand for higher engine operating temperatures to produce greater car heater performance, a large number of thermostats have been damaged or rendered unfit for further use due to the foregoing conditions.

Winter Fronts and Radiator Covers

Some car owners install manually-adjusted covers on the front of the radiator grille for use during cold weather, and these are often responsible for excessive cooling solution loss, particularly when an alcohol type anti-freeze is used.

Such covers when used are generally adjusted for severe weather conditions, and because they cannot be reached from the driver's seat, the adjustment or coverage is not changed for driving in mild or warmer weather until the cooling solution boils, sometimes resulting in serious damage or complete failure of the thermostat.

High Control Temperature

Continued loss of cooling solution without any apparent previous overheating may also be an indication of a thermostat failure.

On rare occasions, a very tiny hole may develop in the metal of the thermostat bellows which will permit a small quantity of the cooling solution to be drawn inside the bellows, although not a sufficient amount to completely destroy the vacuum or ability to pull the valve toward the closed position. This dilution caused by cooling solution getting inside the bellows, reduces the vapour pressure of the normal liquid charge in the bellows and causes the thermostat to operate at a higher control temperature than originally intended or designed for. The result of this condition is a loss of the cooling solution from after boil, particularly with types of anti-freeze having a low boiling point, such as alcohol.

Checking the Thermostat

Should the engine become overheated for any reason not otherwise noticeable, the FULLY OPEN and CLOSED temperature of the thermostat should be checked as follows:

1. FULLY OPEN

   Place the thermostat in a pan of hot water which is 25 degrees hotter than the temperature stamped on the thermostat.

   The bellows should be completely under the water and the water should be agitated thoroughly.

   Under this condition the thermostat valve should be fully open.

2. CLOSED

   Repeat the above in water which is 10 degrees colder than the temperature stamped on the thermostat.

   Under this condition the thermostat valve should be fully closed.

Alkaline Solutions Reduce Battery Carrier Corrosion

A number of inquiries have been received as to the best method of preventing the battery carrier from rusting due to a spillage or overflow of battery solution.

The easiest way to prevent corrosion is to keep either a bottle of household ammonia or a saturated solution of washing soda on hand, and to apply this where the spillage occurs, or is discovered.

WHEEL ALIGNMENT

Car handling ease—good riding qualities—maximum tire life and driving comfort are all features which the owners of General Motors cars look for and find in their automobiles. All of these qualities are affected by one single item—proper wheel alignment.

The subject of wheel alignment sounds like a comparatively simple matter to an ordinary layman, but servicemen know it is far from that. Although the front wheels are solidly mounted, their action is of necessity very flexible as they have to spin on their axis, turn sideways in exact relation with each other, move up and down independently, tilt outward at the top and inward at the front, each within ½° of the other.

Front wheel alignment means keeping all of these associated factors in their proper relationship to each other, in order to achieve the effects mentioned above. Is it any wonder then that such an important item as wheel alignment requires precision equipment and skilled workmanship to service?

Measuring front wheel alignment is not a difficult job, but is rather one in which considerable care must be exercised to assure accuracy. Accurate wheel alignment measurements depend upon two factors—accurate and adequate measuring equipment, and the proper technique of making measurements by the serviceman.

The importance of both accurate equipment and proper procedue is clearly illustrated by a survey on front wheel alignment methods by factory engineers. The wheel alignment of a car was thoroughly checked at the factory, and then taken to four other places where it was checked by different sarvicemen on different machines.

This survey revealed surprising differences in the wheel alignment on this one car. These differences, furthermore, were not due to variations in the equipment, as all of the equipment proved upon test to be sufficiently accurate. Instead, differences in measurements all proved to be due to differences in methods, and particularly to lack of sufficient care in certain details by some of the operators.

As a result of this survey, a review of methods of measuring wheel alignment and proper care of alignment equipment has been prepared for the benefit of servicemen everywhere. The material contained in this following review is sufficiently general in nature to be adaptable to all types of alignment and all series of General Motors cars.

Measuring Methods

All wheel alignment equipment manufacturers provide detailed instructions for measuring front wheel alignment with their particular equipment. Follow these instructions to the letter to make sure that you are doing the job accurately.

In addition to the instructions for wheel alignment measurement the specifications recommended by the car manufacturer should be carefully observed. These specifications are found in the Shop Manuals of the different series.

1. Check to see that the trunk is not loaded and also to see how much gas there is in the tank. Factory alignment recommendations are based on curb weight which includes a full tank of gasoline. If the tank is empty, the negative caster will be increased as much as ⅜ of a degree (positive caster would be decreased) on some models. Allowance for the amount of gasoline in the tank should be taken into consideration when measuring caster, or better still, get the customer's authorization to fill the tank.

2. Align the car on the movable plates of the alignment machine carefully, making sure that the wheels are in the centre of the plates. In addition, the car should be square on the tracks.

3. Inflate tires to the proper pressure.

4. Block both rear wheels, *in addition to setting the brakes,* to prevent any slight movement of the car.

5. Raise the front wheels and check runout on the surface of the tire which the equipment contacts. Mark the spot where maximum runout occurs.

6. Place the maximum runout either to the front or rear. (This neutralizes the effect of runout increasing or decreasing camber.) Lower the wheels.

7. Normalize the position of the front springs by working the front end of the car up and down as height of front springs affects alignment. If any person should get into the car while it is on the alignment machine, the springs will have to be normalized again.

8. Check caster and camber.

9. Raise front wheels and set maximum runout at top or bottom, to neutralize effect on toe-in and toe-out. Lower wheels.

10. Normalize front springs again as previously explained.

11. Check toe-in and toe-out.

If any of the measurements are beyond the recommended limits, make the corrective readjustments in accordance with the detailed instructions as given in the Shop Manual. Recheck after readjustments are completed.

Care of Equipment

There are many other kinds of precision wheel alignment equipment in the use among distributors and dealers. All of this equipment, regardless of make or type, will doubtless give accurate measurements and readings for all factors of wheel alignment—if the equipment is new or kept in good condition.

It is imperative, therefore, that wheel alignment equipment be kept in the best of condition to assure its accuracy. Follow the outline below as often as need be to keep your equipment in tip-top shape.

1. Oil all moving parts regularly to prevent wear and any binding action that might give an inaccurate reading.

2. Keep the machine clean, not only from an appearance standpoint, but because dirt or grit in the mechanism may prevent its proper operation.

3. Inspect all important parts of the machine periodically to see that there is no excessive wear or there are no loose, damaged or broken parts.

4. Paint the machinery periodically to keep it new looking and attractive, and to protect metal parts from rust.

5. Use the wheel alignment machine carefully and with particular care to the measuring instruments.

However sturdy they may be, abuse and careless use will detract from their accuracy.

CARBURETOR SERVICE

This is the first of a series of articles on Carburetor Service to be published in succeeding issues of Products Review under the above heading.

Gasoline must be mixed with the proper proportions of air in order to burn, therefore, the carburetor must deliver to the motor the proper mixture of air and gasoline regardless of:—

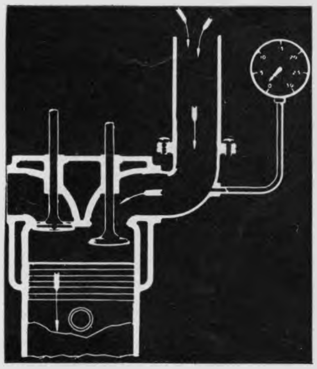


Fig. 61A.

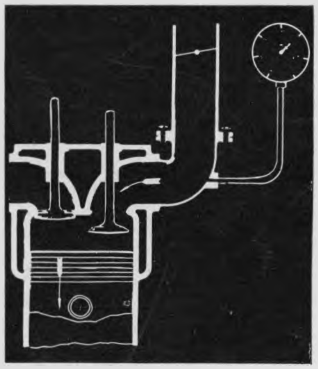


Fig. 61B.

1. Motor Speed—whether you are driving 5 m.p.h. or 75 m.p.h.
2. Load—whether the car is empty or the back seat is loaded.
3. Atmospheric Conditions—whether it is raining, sleeting, a blizzard at 20 below, or whether it is 120 in the shade.

The carburetor must automatically adjust itself to all these conditions. Now let us see how this is accomplished.

We are all familiar with nature's law that air tends to flow from an area of high pressure to an area of lower pressure. If an air valve is opened in a compressor tank, air is pushed from the tank through the valve, out into the outside air.

In the gasoline engine, as the piston moves down, the air flows in through the manifold to take the place of the piston as illustrated in Fig. 61A.

If the end of the intake is closed, no air can flow in as the piston goes down and a pressure difference is created as shown by the vacuum gauge, see Fig. 61B. If this opening is restricted no air can flow into the manifold, which results in a high vacuum.

By inserting a venturi in the carburetor as shown in Fig. 62A somewhat the same result is obtained, a reduced pressure in the manifold and in the venturi even though the air is allowed to enter.

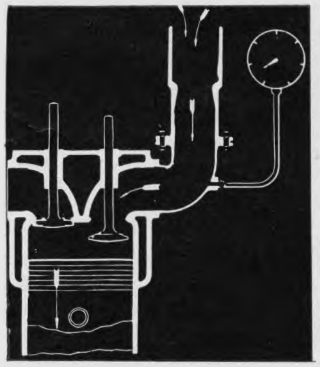


Fig. 62A.

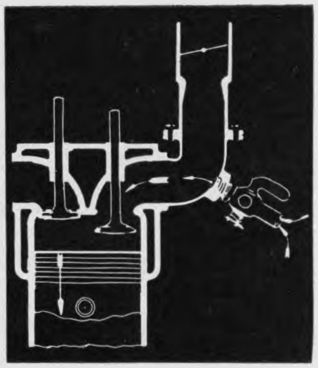


Fig. 62B.

However, as the amount of air entering through the carburetor is increased, the greater is the pressure difference.

If we make an opening in the manifold, as shown in Fig. 62B, air will move from the high pressure on the outside to the low pressure on the inside. If a hole is drilled below the restriction, outside air will tend to flow into the low pressure in the manifold.

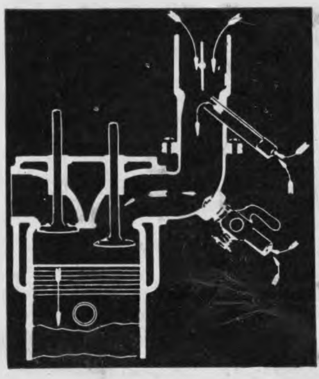


Fig. 63A.

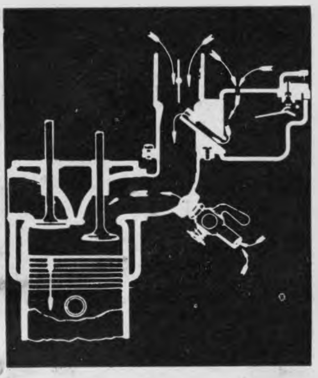


Fig. 63B.

If we place a tube in the manifold, as shown in Fig. 63A, air will pass through that also. The addition of the bowl with a vent as shown in Fig. 63B, does not prevent air from passing through the tube. As long as the air is not restricted, it will continue to flow through the tube.

With gasoline in the bowl and the engine turning over, air attempts to get in as before and pushes gasoline out of the nozzle as shown in Fig. 64A, however, if anything gets in the way of the air it will be pushed through the tube into the manifold.

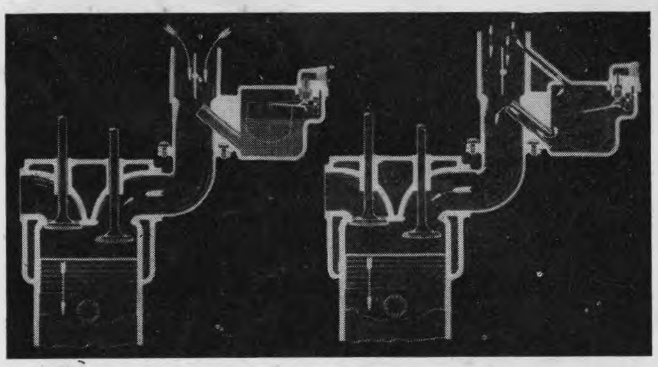


Fig. 64A. **Fig. 64B.**

If we obstruct the flow of air through the carburetor air horn as shown in Fig. 64B, it increases the pressure difference and causes more gasoline to flow through the jets. This is the principal of the choke. It should not be overlooked, however, that dirt and gum in the air horn also retard the flow of air, even though the choke is open, therefore when servicing a carburetor care should be taken to clean all deposits from the inside of the air horn.

When the vent in the bowl is stopped up, air cannot enter and no gasoline is forced through the nozzle, as shown in Fig. 65A, air must be allowed to enter the bowl in order to force the gasoline to leave the nozzle.

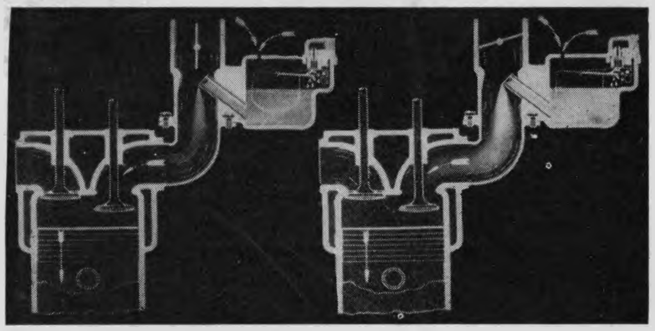


Fig. 65A. **Fig. 65B.**

An inside or "balanced" vent operates on the same principle only the vent is carried in the air horn, see Fig. 65B, in this manner the air pressure on the gasoline in the bowl is made the same as the pressure in the air horn, see Fig. 66, a dirty air cleaner will cause slightly less than atmospheric pressure in the air horn and the bowl, therefore, any outside bowl leaks will result in decreased gasoline mileage.

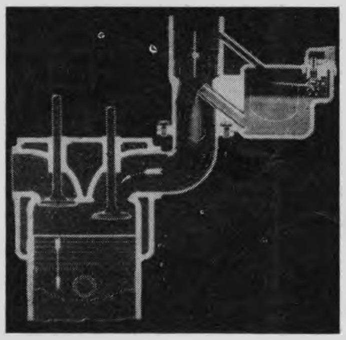


Fig. 66.

In the next issue we shall deal with the origin of the various circuits found in present day carburetors.

* * *

Did You Know That—

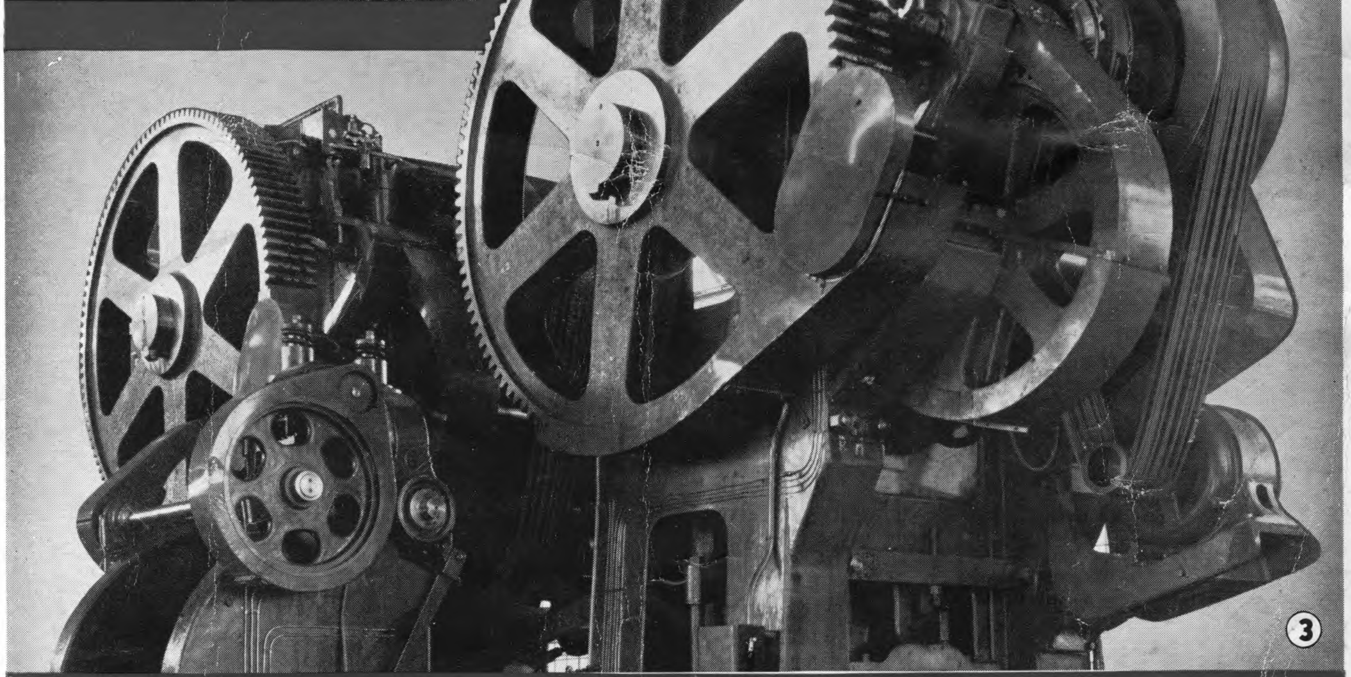
In 1892 Charles E. Duryea built the first gasoline motor vehicle in America—a one-cylinder "Buggyaut".

In 1894 Charles B. King drove a four-cylinder automobile in Detroit. This was the first car to appear on the streets of that city.

PICTORIAL NEWS

①

②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④

(No. 1) A first-hand inspection of the tremendous war production programme at the Oshawa plant of General Motors was made recently by Hon. Angus Macdonald, Minister of National Defence for Naval Service. In the group are, left to right, Hon. W. H. Moore, M.P. for Ontario County; R. S. McLaughlin, President of General Motors of Canada; Mr. Macdonald and J. B. Highfield, General Plant Manager of General Motors. (No. 2) Specially built for the Moncton Training School of the R.C.A.F., this 1941 GMC fire truck has equipment particularly engineered for coping with gasoline fires. (No. 3) Designed for the manufacture of sixteen-inch and twenty-inch steel wheels for army trucks and capable of producing one thousand units per day, two gigantic presses have been installed in the General Motors stamping plant at Oshawa. Illustration No. 4 shows a recent parade of the members of the Brantford General Motors Volunteer Auxiliary Drivers' Corps.

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